Health Consultation

Technical Document Review
Recirculating Groundwater Remediation Well Feasibility Test

Fruit Valley Neighborhood
(a/k/a Cadet Manufacturing Company)
Vancouver, Clark County, Washington

February 2, 2004

Prepared by

The Washington State Department of Health
Under a Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

Foreword

The Washington State Department of Health (DOH) has prepared this health consultation in cooperation with the Agency for Toxic Substances and Disease Registry (ATSDR). ATSDR is part of the U.S. Department of Health and Human Services and is the principal federal public health agency responsible for health issues related to hazardous waste. This health consultation was prepared in accordance with methodologies and guidelines developed by ATSDR.

The purpose of a health consultation is to identify and prevent harmful human health effects resulting from exposure to hazardous substances in the environment. Health consultations focus on specific health issues so that DOH can respond to requests from concerned residents or agencies for health information on hazardous substances. DOH evaluates sampling data collected from a hazardous waste site, determines whether exposures have occurred or could occur, reports any potential harmful effects, and recommends actions to protect public health. The findings in this report are relevant to conditions at the site during the time of this health consultation, and should not necessarily be relied upon if site conditions or land use changes in the future.

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Glossary

Acute	Occurring over a short time [compare with **chronic**].
Agency for Toxic Substances and Disease Registry (ATSDR)	The principal federal public health agency involved with hazardous waste issues, responsible for preventing or reducing the harmful effects of exposure to hazardous substances on human health and quality of life. ATSDR is part of the U.S. Department of Health and Human Services.
Aquifer	An underground formation composed of materials such as sand, soil, or gravel that can store and/or supply groundwater to wells and springs.
Chronic	Occurring over a long time (more than 1 year) [compare with **acute**].
Contaminant	A substance that is either present in an environment where it does not belong or is present at levels that might cause harmful (adverse) health effects.
Dermal Contact	Contact with (touching) the skin (see route of exposure).
Environmental Protection Agency (EPA)	United States Environmental Protection Agency.
Exposure	Contact with a substance by swallowing, breathing, or touching the skin or eyes. Exposure may be short-term [**acute exposure**], of intermediate duration, or long-term [**chronic exposure**].
Groundwater	Water beneath the earth's surface in the spaces between soil particles and between rock surfaces [compare with surface water].
Hazardous substance	Any material that poses a threat to public health and/or the environment. Typical hazardous substances are materials that are toxic, corrosive, ignitable, explosive, or chemically reactive.
Indeterminate public health hazard	The category used in ATSDR's public health assessment documents when a professional judgment about the level of health hazard cannot be made because information critical to such a decision is lacking.
Ingestion	The act of swallowing something through eating, drinking, or mouthing objects. A hazardous substance can enter the body this way [see route of exposure].

Inhalation	The act of breathing. A hazardous substance can enter the body this way [see **route of exposure**].
Monitoring wells	Special wells drilled at locations on or off a hazardous waste site so water can be sampled at selected depths and studied to determine the movement of groundwater and the amount, distribution, and type of contaminant.
No apparent public health hazard	A category used in ATSDR's public health assessments for sites where human exposure to contaminated media might be occurring, might have occurred in the past, or might occur in the future, but where the exposure is not expected to cause any harmful health effects.
No public health hazard	A category used in ATSDR's public health assessment documents for sites where people have never and will never come into contact with harmful amounts of site-related substances.
Organic	Compounds composed of carbon, including materials such as solvents, oils, and pesticides that are not easily dissolved in water.
Route of exposure	The way people come into contact with a hazardous substance. Three routes of exposure are breathing [inhalation], eating or drinking [ingestion], or contact with the skin [dermal contact].
Surface Water	Water on the surface of the earth, such as in lakes, rivers, streams, ponds, and springs [compare with **groundwater**].
Volatile organic compound (VOC)	Organic compounds that evaporate readily into the air. VOCs include substances such as benzene, toluene, methylene chloride, and methyl chloroform.

Background and Statement of Issues

The Washington State Department of Health (DOH) has prepared this health consultation report to summarize the results of its technical review of the Cadet Manufacturing Company (Cadet), *Work Plan and Specifications for a Feasibility Test of Recirculating Groundwater Remediation Well System for the Fruit Valley Neighborhood* (August 2003) and *Response to Ecology's Comments on Work Plan and Specifications for a Feasibility Test of Recirculating Groundwater Remediation Well System for the Fruit Valley Neighborhood* (October 29, 2003**)**.[1,2] DOH conducted its review of these documents because of the potential health concerns associated with conducting the feasibility test in the nearby residential portion of the Fruit Valley Neighborhood (FVN) where children live and play. DOH prepares health consultations under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR).

The FVN is located east and north of the Cadet property, which is located at 2500 West Fourth Plain Boulevard in Vancouver, Clark County, Washington. The Cadet property is the source area for the chlorinated solvent contaminated groundwater that underlies a significant portion of the FVN. The contaminated groundwater has migrated eastward to the Burlington Northern Santa Fe (BNSF) railroad tracks, northward between West 31st Street and La Frambois Road, and southeastward toward Port of Vancouver property.[3] The predominant chlorinated solvents found in groundwater include trichloroethylene (TCE) and tetrachloroethylene (PCE). Other chlorinated solvents, including 1, 1 dichloroethene (1, 1-DCE), have also been detected.

Chlorinated solvents dissolved in groundwater can evaporate and move up through the soil and enter homes and other buildings, potentially affecting indoor air quality. The objective of Cadet's feasibility test for the groundwater remediation system is to determine whether the proposed treatment system (i.e., recirculating groundwater remediation well (RGRW) and sodium permanganate injection) will be effective in reducing chlorinated solvent concentrations, particularly TCE and PCE, in groundwater below the FVN to target remediation levels. Cadet developed the target remediation levels, which are designed to be protective of residential indoor air, using the Johnson & Ettinger (J&E) vapor intrusion model.[2]

Because of the potential for residents of the FVN to be exposed to chlorinated solvents during the feasibility test, DOH was compelled to review Cadet's feasibility test work plan and specifications and responses to the Washington State Department of Ecology (Ecology) comments. DOH received the documents on October 29, 2003, and after completing its preliminary review two days later, it discussed its health concerns with the Ecology (Craig Rankine, Washington State Department of Ecology, personal communication, October 31, 2003). These preliminary comments were summarized in an e-mail message on November 3, 2003.[4]

Discussion

The *Work Plan and Specifications for a Feasibility Test of Recirculating Groundwater Remediation Well System for the Fruit Valley Neighborhood* and *Response to Ecology's Comments on Work Plan and Specifications for a Feasibility Test of Recirculating Groundwater*

Remediation Well System for the Fruit Valley Neighborhood summarize the feasibility testing activities that will be conducted in the FVN.

DOH's previous health concerns about the formation of more toxic daughter products and chlorine gas during the injection of the sodium permanganate during the feasibility test are no longer an issue. DOH now understands that the sodium permanganate breaks down the TCE and PCE in the contaminated groundwater by breaking the carbon-carbon double bond associated with these chemicals, rather than the carbon-chloride bond. Consequently chemicals like vinyl chloride and chlorine gas should not be generated (Lenford O'Garro, Washington State Department of Health, personal communication, November 6, 2003).

The comments below summarize the remaining DOH health concerns about the proposed project. Recommendations follow each comment.

1. An area of the FVN where some of the highest groundwater contaminant concentrations exist off of the Cadet property is the area where Cadet plans to conduct the feasibility test for the RGRW system. The test will include the injection of sodium permanganate into the aquifer. No information is presented in the above documents to indicate whether Cadet has considered potential health effects to the nearby FVN residents due to the feasibility test. DOH assumes that health risks to workers are being addressed in an Ecology - reviewed health and safety plan developed for the project.

   Recommendation – DOH recommends that Ecology have Cadet consider and address the potential health effects to the FVN, if any, before injecting the sodium permanganate.

2. A vault is proposed for construction as part of the feasibility test. However, there is no information provided in the plan to indicate whether the vault will be vulnerable to the migration of any subsurface contaminants and pose a potential health threat to workers entering the vault.

   Recommendation – DOH recommends that the Ecology have Cadet address this issue as part of its design plan as well as its health and safety plan, since it appears to be a confined entry situation.

3. According to Cadet's response to Ecology's comments on the feasibility study work plan, the potential remediation leave (PRL) for TCE for protecting indoor air remains at 131 micrograms/liter (ug/1), not the 1.1 ug/1 level as Ecology indicated had been discussed with Cadet (Craig Rankine, Washington State Department of Ecology, personal communication, October 29, 2003). Cadet used the J& E vapor intrusion model and 1995 guidance to calculate the groundwater TCE remediation level of 131 ug/1.

   Recommendation –DOH requests that Ecology review Cadet's proposed groundwater remediation levels, which are supposed to be protective of indoor air, and have Cadet provide groundwater, soil gas, and air data to support the use of the modeled groundwater cleanup levels because there is uncertainty associated with vapor intrusion modeling.

4. Cadet is proposing to use natural attenuation with the RGRW, assuming that the feasibility test is successful, but there is no discussion or reference in the work plan about the viability of natural attenuation and how it might affect indoor air or groundwater, both exposure pathways that pose a potential health risk.

   Recommendation – DOH recommends that Ecology have Cadet evaluate the potential health risks posed by natural attenuation if this is a likely cleanup option for this site.

5. Peristaltic pumps are proposed for sampling groundwater during the RGRW testing. However, these sampling devices are not appropriate for collecting volatile organic compound (VOC) samples since air can become entrained in the sample, artificially reducing contaminant concentrations. This could result in an under estimation of health risks posed to the FVN.

   Recommendation – DOH recommends that Ecology have Cadet select a more appropriate sampling device for collecting VOC samples.

6. Permanganate oxidation has the potential for some natural metals to become more toxic when oxidized. For example, trivalent chromium can be oxidized to the more toxic hexavalent chromium.

   Recommendation – DOH recommends that Ecology have Cadet perform metal testing during the feasibility test to ensure that the chemical oxidation process does not cause a problem with metals.

Child Health Considerations

The goal of the Cadet RGRW system feasibility test is to evaluate whether the system can effectively reduce groundwater chlorinated solvent concentrations to a level that will protect indoor air quality in the FVN. The FVN is an area where children could potentially be exposed to chlorinated solvents migrating from contaminated groundwater to indoor air. Children may be uniquely vulnerable to the hazardous effects of environmental contaminants. Children breathe more air per pound of body weight than do adults resulting in higher levels of exposure to contaminants in air. Additionally, the fetus may be highly sensitive to many chemicals, particularly with respect to potential impact on childhood development. For these reasons, DOH has determined that it is very important to consider the effects that cleanup remedies like the RGRW system may have on children, as well as other sensitive populations. DOH will continue evaluating these potential exposures as information becomes available.

Conclusions

The goal of the Cadet RGRW system feasibility test is to evaluate whether the proposed system can effectively reduce groundwater chlorinated solvent concentrations to levels that will be protective of public health in the FVN. However, since there is some uncertainty about the health

risks posed by the Cadet RGRW system feasibility test, this site is categorized as an indeterminate public health hazard.

Recommendations

1. DOH makes the following recommendations, which are described in more detail in the discussion section above:

   - The potential health risks associated with the feasibility test, if any, should be identified and addressed before injecting the sodium permanganate.
   - The design and health and safety issues associated with the vault should be addressed during the planning process.
   - Predicted groundwater remediation levels should be evaluated to ensure that they are protective of the public health of residents of the FVN (groundwater to indoor air pathway).
   - Potential health risks associated with natural attenuation should be evaluated if it is a likely cleanup option.
   - Appropriate groundwater sampling devices should be selected when collecting VOC samples during the feasibility test.
   - Metals testing should be performed during the feasibility test.

Action

Ecology should provide written responses to DOH concerning the recommendations listed in this consult.

2. DOH recommends that future documents regarding the RGRW or other cleanup options be provided to DOH for review so it can evaluate whether the option(s) pose a health concern.

Action

DOH will continue working with Ecology to review and comment on remediation documents associated with the Cadet site.

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References

1. AMEC Earth & Environmental, Inc. Work plan and specifications for a feasibility test of recirculating groundwater remediation well system for the Fruit Valley Neighborhood, Cadet Manufacturing Company. Portland, Oregon: AMEC Earth & Environmental; 2003 August.

2. AMEC Earth & Environmental, Inc. Response to Ecology's comments on work plan and specifications for a feasibility test of recirculating groundwater remediation well system for the Fruit Valley Neighborhood, Cadet Manufacturing Company. Portland, Oregon: AMEC Earth & Environmental; 2003 October 29.

3. AMEC Earth & Environmental, Inc. Semi-annual groundwater monitoring report 2002. Portland, Oregon: AMEC Earth & Environmental, Inc.; 2003 February.

4. Washington State Department of Health. E-mail from Barbara Trejo to Craig Rankine, Washington State Department of Ecology, concerning the feasibility test for the recirculating groundwater remediation system. Olympia, Washington, November 3, 2003.

Certification

This Health Consultation for the Cadet site was prepared by the Washington State Department of Health under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the health consultation was begun.

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The Division of Health Assessment and Consultation, ATSDR, has reviewed this public health consultation and concurs with the findings.

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